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Lower Willamette Group

Co-Chairperson: Bob Wyatt, NW Natural
Co-Chairperson: Jim McKenna, Port of Portland

January 11, 2006

Chip Humphrey
Project Manager
U.S. Environmental Protection Agency
811 SW Sixth Avenue, 3rd Floor
Portland, OR 97204

Eric Blischke
US EPA
811 SW 6th Avenue, 3rd Floor
Portland, OR 97204

Re: Portland Harbor RI/FS
Round 3 Data Gaps

Dear Chip and Eric:

Thank you for your letter of December 2, 2005. At your invitation during the Portland Harbor managers meeting on December 21, the Lower Willamette Group is writing to provide EPA with our proposed approach to Round 3 data collection for the Portland Harbor RI/FS. We offer this input in the interest of developing a well-conceived sampling design for Round 3 and hope that it will inform the draft Round 3 scope of work EPA is preparing to deliver to the LWG by February 3, 2006.

The Administrative Order on Consent for the Portland Harbor RI/FS defines the objectives for the RI/FS: The RI/FS must evaluate releases or threatened releases of hazardous substances to the in-water portion of the Site for the protection of survival, growth and reproduction of benthic invertebrates, fish, shellfish, birds, mammals and species listed under the Endangered Species Act, as well as for the protection of human health (cancer and non-cancer impacts) from ingestion of aquatic life and exposure to sediments, surface water and groundwater as a result of dermal exposure and incidental ingestion through expected beach use, in-water recreation, occupational activities, and ceremonial and subsistence fishing. *Statement of Work*, p. 10. These objectives have been further refined and described by the *Portland Harbor Programmatic Work Plan* (LWG, April 23, 2004), which was approved by EPA on June 29, 2004.

To meet these objectives, the LWG has been collecting RI/FS data for nearly five years. To date, we have successfully implemented numerous EPA-approved field sampling plans, which have resulted in the collection of more than 1700 beach, surface, and subsurface sediment samples for chemical analysis, as well as an additional 268 sediment samples for bioassay or laboratory bioaccumulation testing. We have collected 410 crayfish and 1780 fish for tissue analysis, as well as invertebrates from 240 multiplate devices from ten locations and more than 600 clams from 36 locations. We have collected 75 surface water samples during three events for analysis by 18 analytical methods. We have collected 226 groundwater and transition zone water samples from 108 locations, and additional surface sediment samples at a subset of these locations. We have conducted Sediment Trend Analysis® and sediment profile image surveys of

the lower Willamette River, installed and monitored sediment stakes at eight nearshore areas, performed four rounds of high resolution bathymetry, and developed a numerical hydrodynamic/sediment transport model to assist our understanding of the physical system. In addition, we have compiled data of quality acceptable to EPA from over one thousand samples collected by other parties, which we will incorporate into our analysis. Together these efforts represent a large majority of the data needed to complete the RI/FS. We believe, as EPA noted in its March 11, 2003 Round 2 Sampling Rationale, that this data provides "adequate sediment chemistry data for nature and extent characterization, and sufficient data necessary to complete a baseline risk assessment and begin to develop the Feasibility Study."

The EPA-approved goals for Round 3 of the RI/FS are to collect data required for the feasibility study and to obtain data needed to reduce uncertainties identified in preliminary risk evaluations, as described in the Programmatic Work Plan. *See, Programmatic Work Plan*, p. 103. We agree that a number of the questions raised by your December 2 letter must be answered to meet the objectives of the RI/FS, and we have organized a general description of our proposed approach to Round 3 generally to fit the "data use" categories identified in Table 9 of your letter.

We agree that additional sediment and water data must be collected upstream and downstream of the Study Area to estimate contaminant transport to and from the site, characterize background concentrations of certain chemicals, and assist in the definition of site boundaries. An outline of our proposed approach to upstream and downstream data collection is attached at Tabs 1 and 2, respectively. We agree that additional data collection is necessary within the Study Area to support the feasibility study. Our approach to feasibility study (including areas of potential concern) data collection is outlined at Tab 3. Data assessment required to meet the objectives of the human health risk assessment is outlined at Tab 4. The lines of evidence for the ecological risk assessment (ERA) and the additional data needed to meet ERA objectives and make management decisions are outlined at Tab 5. Our approach to data collection and analysis for the hydrodynamic model, contaminant fate and transport evaluation, and recontamination potential is outlined at Tab 6. Food web model data needs and assessment are outlined at Tab 7.

We are providing this outline of our proposed approach to Round 3 as a preliminary response to your December 2 letter and to help inform the sampling plan or approach EPA has indicated it will deliver to the LWG in February. The LWG is concerned that EPA's December 2 comments suggest that EPA may ask the LWG to undertake work that is, in a number of respects, well beyond the requirements for an RI/FS established by the National Contingency Plan, EPA guidance, the Portland Harbor AOC, the approved Programmatic Work Plan, and precedent at other sites. Some of the major areas of our concern with EPA's December 2 comments include:

- the requirement to investigate source areas of potential sediment contamination well upstream of the initial study area that are unrelated to the operations of any AOC signatory;

- the insertion of non-CERCLA (e.g. natural resource damage) objectives (e.g., deleterious effects to ecological receptors into the management goals and objectives for the ecological risk assessment) into the RI/FS. At our December 13 meeting,

EPA said that it recognized that its December 2 letter includes non-CERCLA objectives and promised to clarify that not all of these objectives can be achieved through the implementation of CERCLA alone. However, certain of the tasks contemplated by the December 2 letter appear to be related to these non-CERCLA objectives (e.g. evaluation of olfactory function and liver lesions in fish);

- the scope of additional tissue collection, much of which is not required to meet RI/FS objectives established by CERLCA, the AOC and the approved Programmatic Work Plan;

- the addition of multiple human health exposure scenarios (e.g. use of untreated Willamette River water for residential and industrial uses and ingestion of shellfish) and ecological receptors (e.g. adult salmon, adult lamprey, and terrestrial plants) beyond those required by the AOC or approved Programmatic Work Plan;

- the approach to fate and transport modeling;

- applications of and acceptable uncertainty of the food web model;

- changes to approved assessment approaches for the baseline risk assessment (e.g. evaluating olfactory function in risk assessment of adult Chinook and the use of modeling rather than empirically measured tissue concentrations in the human health risk assessment);

- rationale for inclusion of PBDE and manganese as COIs.

Our concerns with EPA's comments, will be fully discussed with EPA and its partners and will be further detailed as appropriate in a formal response to EPA's data gap comments and EPA's forthcoming Round 3 approach to be provided to EPA in February.

The LWG is concerned that the data collection and additional analysis suggested by EPA's December 2 comments could significantly delay the project. We hope that, as EPA works on a more specific approach to Round 3, it will identify the rationale for proposed data collection, specify the proposed use of the data to be collected, and consider scope, schedule and cost implications for the additional data collection. Our preliminary estimates indicate that costs required to collect EPA's proposed Round 3 data could rival total project costs to date, which itself suggests that the RI/FS could not be completed for several years or could not be completed by the current AOC signatories. The LWG believes that our approach to Round 3 provides the information necessary to meet the RI/FS objectives and to allow EPA to make remedial decisions in 2008 that can begin to be implemented. As EPA guidance notes, "[m]anagement decisions must be made, even when information is imperfect. There are uncertainties associated with every decision that need to be weighed, evaluated, and communicated to affected parties. Imperfect

knowledge must not become an excuse for not making a decision." *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* (EPA, February 12, 2002).

We look forward to continuing discussion of these important issues.

Very truly yours,
The Lower Willamette Group

Bob Wyatt
Co-Chair

Jim McKenna
Co-Chair

cc: LWG Executive Committee
LWG Legal Committee

TAB 1 - ROUND 3 UPSTREAM SAMPLING PROGRAM

OBJECTIVES

The two major objectives of the upstream sampling program are to estimate:

1) contaminant loading to the Initial Study Area from upstream during both typical hydrologic conditions and high flow events; and
2) background concentrations of naturally occurring substances (e.g., metals) and anthropogenic contaminants in surface water and sediment in the Lower Willamette River upstream of the Initial Study Area.

An estimate of contaminant loading (Objective No. 1) is needed to assess the potential for recontamination and natural recovery of surface sediments at the site. An estimate of background concentrations (Objective No. 2) is needed to support qualitative or semi-quantitative discussions of the contribution from background in the human health and ecological risk characterizations and to identify cleanup goals in the feasibility study. Data obtained from the upstream sampling program may also be used to support the establishment of an upstream site boundary.

APPROACH

The proposed upstream sampling approach includes:

1) the collection of surface water and suspended sediments across a range of flow conditions at the upstream end of the study area (~ RM 11) and at the upstream end of the downtown reach (~RM 16) to characterize the nature of the surface water and suspended sediments entering these reaches
2) the evaluation of existing surface sediment data from the upstream portion of the study area and from RM 16 to the Willamette Falls to characterize the nature of deposited sediments in these reaches
3) the collection of additional surface sediments in the reaches described above if warranted based on the evaluation of the existing data
4) the collection of sediment cores from known depositional zones in the upstream portion of the study area for stratigraphic interpretation, radioisotope analysis, and contaminant chemical analyses with depth to provide empirical evidence of chemical concentrations in sediments deposited during past high-flow events (e.g., the 1996 flood).

The attached table summarizes the approach proposed to meet the objectives of the upstream sampling program and includes additional details on the proposed sample types, locations, and timing.

Proposed Round 3 Upstream Sampling Approach

	Contaminant Loading (to evaluate recontamination and MNR potential)					***Background/Ambient Conditions[2]***		
	loading during typical hydrologic conditions		*loading during figh flow events*					
Reach	*Surface Water*	*Suspended Sediment*	*Surface Sediment*	*Subsurface Sediment*		*Surface Water*	*Suspended Sediment*	*Surface Sediment*
RM 9.2 to 11.7 (head of navigation channel)	RM 11 surface water transect sampled over a range of flow conditions (combined Round 2 and Round 3 data)	RM 11 sediment trap deployed for one year and sampled seasonally	No new data proposed - existing data from depositional areas away from sources may be used as qualitative line of evidence of nature of material settling out in study area	10+ ft cores in deep, long-term depositional areas to provide vertical profiles of chemical concentrations over time[1]		RM 11 surface water transect provides data on nature of material entering the study area from upstream	RM 11 sediment trap provides data on nature of suspended sediment entering the study area from upstream	Selected existing surface sediment data (depositional zones away from sources) represent sediments accumulating in the site. Limited additional surface samples my be warranted to supplement existing data.
Rm 11.7 to 16 (downtown Portland to Ross Island)	none	none	none	none		none	none	none
RM 16 to Willamette Falls (~ RM 26)	RM 16 (upstream of Ross Island) surface water transect sampled over a range of flow conditions	RM 16 sediment trap deployed for one year and sampled seasonally	none	none		RM 16 surface water transect provides data on nature of material entering the downtown reach from upstream	RM 16 sediment trap provides data on nature of suspended sediment entering the downtown reach from upstream	Existing sediment data (from depositional areas) provide data on nature of fine-grained sediments in this reach. Limited additional surface samples may be warranted to supplement existing data.

[1] Two sets of side-by-side cores will be vertically sectioned - one will be analyzed for radioisotopes and the other for target COCs. These data will provide empirical information on the chemical nature of sediments that were deposited in the upstream portion of the study area from all upstream sources during the 1996/1997 high flow events.

[2] In the absence of a defined site boundary, the proposed approach is designed to provide comparative data on the nature of sediments and water entering the downtown reach from upstream of RM 16 and the nature of sediment and water entering the study area from upstream of RM 11.

TAB 2 - ROUND 3 DOWNSTREAM SAMPLING PROGRAM

OBJECTIVES

The objective of the downstream sampling program is to determine the extent of potential downstream contamination from the site in the Willamette River below RM 2 and in the upstream portion of the Multnomah Channel.

APPROACH

The proposed downstream sampling approach includes:

1) collection of surface water and suspended sediment samples across a seasonal range of flow conditions at the downstream end of the study area (~ RM 2) and in the mouth of the Multnomah Channel (within 1000 ft of the Willamette River) to characterize the nature of surface water and suspended sediments being transported through these areas
2) collection of additional surface sediment samples in depositional areas in the lower Willamette River between RM 0 and RM 2 based on an evaluation of the existing physical and chemical data in this reach
3) collection of surface sediment samples in depositional zones in the upstream portion of the Multnomah Channel (i.e., from the Willamette River to the Sauvie Island Bridge) if evaluation of the first round of Multnomah Channel surface water and sediment trap data indicate transport of contaminants into the channel from the Willamette
4) compilation of existing bathymetric data for the Multnomah Channel, and if inadequate to identify potential depositional areas needed for item 3), conduct a precision bathymetric survey of the upstream portion of the channel.

The attached table summarizes the approach proposed to meet the objective of the downstream sampling program and includes additional details on the proposed sample types, locations, and timing.

Proposed Round 3 Downstream Sampling Approach

Reach	*Surface Water*	*Suspended Sediment*	*Precision Bathymetry*	*Surface Sediment*
Lower Willamette RM 0 to 2	RM 2 surface water transect sampled over a range of flow conditions (e.g., seasonally) to provide data on the nature of surface water leaving the site on the Willamette	RM 2 sediment trap deployed long-term (e.g., one year with quarterly sampling) to provide data on the nature of suspended sediment leaving the site on the Willamette	Use existing time-series bathymetry to identify depositional areas in the vicinity of and downstream of RM 2	Collect additional surface samples in depositional zones the vicinity of and downstream of RM 2 based on an evaluation of spatial trends in existing surface and subsurface data and physical site information
Upstream Portion of the Multnomah Channel	Mouth of Multnomah Channel surface water transect sampled over a range of flow conditions (e.g., seasonally) to provide data on the nature of surface water leaving the site down the Multnomah Channel	Mouth of Multnomah Channel sediment trap deployed long-term (e.g., one year with quarterly sampling) to provide data on the nature of suspended sediment leaving the site down the Multnomah Channel	Compile existing bathymetry data for the Multnomah Channel and, if needed, conduct a precision bathymetric survey in the upstream portion (e.g., to the Sauvie Island Bridge) of the Multnomah Channel	Collect surface sediment samples in fine-grained, depositional zones away from potential in-channel sources in the upstream portion of the Multnomah Channel if evaluation of the initial Multnomah Channel surface water and sediment trap data indicate water column transport of contaminants into the channel

TAB 3 - STUDY AREA DATA TO SUPPORT THE FS [AREAS OF POTENTIAL CONCERN (AOPCS)]

OBJECTIVES[1]

- Fill data gaps for the nature and extent of Chemicals of Interest (COIs) based on the existing data (Round 1 and Round 2 comprehensive sediment data set and non-LWG data) on an AOPC-specific basis or throughout the study area as warranted
- Refine the delineation of the vertical and lateral extent of contamination necessary to meet the remediation evaluation needs for the FS

APPROACH

Chemicals of Interest Objective - Sediment data on three compound groups - volatile organic compounds, polychlorinated dibenzo-p-dioxins and furans (PCDD/PCDF), and total petroleum hydrocarbons – are limited spatially in the study area. Based on a comprehensive review of the existing sediment data for these and collocated compounds, the preliminary risk evaluations, and potential upland sources, additional samples will be collected at specific AOPCs and/or site-wide to allow delineation of the extent of sediments that have a reasonable potential to pose risk.

Lateral and Vertical Extent Objective -

- Define, through discussion with EPA, the acceptable level of uncertainty for FS evaluations. Use as guidance examples and precedents from other large-scale river remediation Superfund projects and EPA guidance documents (e.g., *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*)
- Determine risk-based site-specific Preliminary Remediation Goals (PRGs) in concert with EPA (to be initially submitted to EPA in the Round 2 Comprehensive Report).
- Define areas of potential future subsurface exposure either through human activities (e.g., dredging) or erosion in large river events (via hydrodynamic modeling) to prioritize areas for more extensive subsurface investigation.
- Use the agreed upon PRGs to refine the AOPCs and define the specific lateral and vertical extent data gaps for each AOPC consistent with the defined acceptable level of uncertainty for the FS and subsurface exposure potential. This would result in a summary table very similar to the Table 5 in EPA's data gaps document, but would have specific numbers and locations of samples and would be developed based on site-specific PRGs rather than literature screening values.
- Conduct lateral and vertical extent sediment sampling (surface and subsurface as needed).

[1] Although sampling related to understanding the loading of surface water and transition zone water chemicals from specific areas of concern to the river is an objective that is discussed under AOPCs in EPA's data gaps document, this objective is primarily addressed in the LWG approach under the Hydrodynamic Model, Contaminant Fate and Transport Model, and Recontamination Potential category—see approach under Tab 6.

TAB 4 - HUMAN HEALTH RISK ASSESSMENT

OBJECTIVES

The specific goals and objectives of the Human Health Risk assessment (HHRA) were agreed upon in the Portland Harbor RI/FS Programmatic Work Plan Appendix C. The LWG believes that the necessary data to meet the goals and objectives of the baseline HHRA for the RI/FS has been collected in accordance with the approved Programmatic Work Plan and that additional data collection is not needed to address the HHRA objectives of the AOC or the Programmatic Work Plan.

The HHRA work plan states:

"The general objective of an HHRA is to characterize the potential risks to human health that may be posed by chemicals present in or entering into environmental media (i.e., water, air, or soil) or bioaccumulating in the food chain. The results of the baseline HHRA help to establish acceptable exposure levels for use in showing that risks to human receptors are acceptable or in developing protective remedial action objectives.

The overall objective of the baseline HHRA for the Portland Harbor Superfund Site (Site) will be to determine whether exposure to chemicals in sediment, surface water, or biota within the Site results in unacceptable risks to human health, thereby warranting consideration of further investigation or possible response action. To achieve the overall objective, the following are specific objectives of the baseline HHRA:

- Identify and select chemicals of potential concern (COPCs) for human health
- Identify potential exposure pathways to human receptors who may contact COPCs within the Site
- Characterize potentially exposed populations and estimate the extent of their exposure to COPCs within the Site
- Quantitatively characterize the noncarcinogenic and carcinogenic risks to the human receptors resulting from potential exposure to COPCs within the Site and identify chemicals of concern (COCs) that will be considered in the risk management phase of the RI/FS."

Additionally, this work plan established an approved approach for the completion of the HHRA including specific information on the use of fish tissue data to calculate exposure point concentrations, including the spatial scale that the tissue samples would be composited for. It also provides an approved set of receptors and exposure pathways to be quantitated in the HHRA. The following discussion addresses specific issues identified by the EPA in the December 2 letter.

APPROACH

Screening Surface Water for Bioaccumulative COPCs versus Screening Tissue Data

In Section 5.3.3 of the EPA Round 3 Data Gap Letter (dated December 2, 2005), the EPA requests that both transition zone water and surface water data be screened against Human Health Ambient

Water Quality Criteria for the Consumption of Organisms (Human health AWQCs) to select COPCs for evaluation of risks from biota consumption. Human health AWQCs are not site-specific and rely on assumptions about bioaccumulation. As a result, the use of human health AWQC to identify water concentrations that are protective of consumption of biota, results in much greater uncertainty in the risk assessment than the use of direct measures of tissue concentrations. When tissue data are available, screening of water concentration data using human health AWQC is not necessary to select COPCs and evaluate risks to human health. Direct screening of transition zone water concentrations against human health AWQCs to select COPCs for biota consumption is not appropriate for the Site, because consumption of bivalves has not been shown to be a complete human health exposure pathway.

The LWG proposes the following approach, which is consistent with the approach previously agreed to in the Programmatic Work Plan, to select COPCs and evaluate risks from fish/crayfish consumption:

- For those chemicals analyzed in tissue, the LWG intends to use measured tissue data to evaluate risks from consuming biota, not surface water or transition zone water data. Chemicals detected in tissue will be selected as tissue COPCs to evaluate risks from fish/crayfish consumption.
- Volatile organic compounds (VOCs) were not analyzed in tissue and have not been analyzed to date in surface water. For VOCs, transition zone water data will be screened against Human health AWQC. If concentrations in transition zone water exceed Human health AWQC, loading and mixing calculations will be performed to determine whether concentrations in surface water could exceed Human health AWQC. If the loading evaluation indicates that surface water VOC concentrations could exceed Human health AWQC over a relevant spatial scale (e.g., the home range of a game fish), either the predicted surface water concentrations will be used or surface water samples will be collected and analyzed for VOCs. The surface water concentrations will then be used with the bioaccumulation factors in the AWQC methodology to predict potential VOC tissue concentrations for use in the risk assessment.
- Polynuclear aromatic hydrocarbons (PAHs) detection limits that did not achieve the specified analytical concentration goals (ACGs) was also presented as a data gap by EPA (Section 5.4.2). The EPA has requested that additional sampling of fish tissue utilized analytical methods that will meet the ACGs for PAHs, however, the LWG is concerned that future sampling may still not be able to achieve the ACG goals. The LWG proposes that surface water be screened against human health AWQCs for PAHs to determine whether any exceedences are present. The surface water concentrations will then be used with the bioaccumulation factors in the AWQC methodology to predict potential PAH tissue concentrations for use in the risk assessment. The use of published bioaccumulation factors is a conservative approach because PAHs are known to be metabolized readily by fish and other vertebrate species.

Smallmouth Bass Data Collection Task

The EPA, in Section 5.4.1 of the December 2 letter, has requested that "additional smallmouth bass should be collected off-shore of selected facilities to estimate localized risk from specific sources of contamination". However, spatial scale of the HHRA was agreed on in the Programmatic Work

Plan. EPA provided the language regarding the scale of evaluation of fish consumption. The LWG does not agree that risks need to be assessed on a source specific basis given the size of both the human exposure areas as well as the fish home ranges.

Given that the home range of smallmouth bass can be up to almost 7 miles and averages about 1 mile (see Table 2 in Appendix C of the Programmatic Work Plan), the LWG questions whether the additional smallmouth bass tissue data could be used to assess risks or evaluate sources on a scale smaller than the bass home range. In addition, the evaluation of impacts from individual sources is not included as a HHRA objective of the Programmatic Work Plan and is not a specific data need for the completion of the RI/FS.

TAB 5 - ECOLOGICAL RISK ASSESSMENT

OBJECTIVES:

The specific goals and objectives of the Ecological Risk Assessment (ERA) were agreed upon in the Portland Harbor RI/FS Programmatic Work Plan (WP) Appendix B, approved in June 2004. The Appendix B of the approved WP (Section 2.1, page 8) states:

"The overall objective for the ecological risk assessment is to identify the risks to ecological receptors from site-related chemicals. If unacceptable risk to ecological receptors is present at the site, the chemicals causing the risk and their pathways to ecological receptors will be identified and become input to risk management decisions about the site." Furthermore, as stated in the data quality objectives (DQOs) of Appendix B of the approved WP (Tables 5-1 through 5-4), the ERA will determine whether exposure to hazardous substances in the site pose an unacceptable risk to the *survival, growth, or reproduction* of ecological receptors (i.e., aquatic plants, benthic invertebrates, shellfish, fish, amphibians, birds, and mammals, including those listed under the Endangered Species Act) in the area.

This summary presents the agreed upon lines of evidence (LOE's) for assessing risk to, and criteria for making RI/FS management decision for each receptor group addressed in EPA's Round 3 Data Gaps document. The LOE's and decision criteria for assessing risk to aquatic plants and amphibians also are included, for completeness. The ERA approach is based on the approved WP, including the selected receptors of concern, selected assessment endpoints, and selected exposure media agreed upon with EPA, EPA's partners, and LWG (see Table 2.9 in Appendix B of the WP). The LWG has reviewed the existing LOE's for the ERA and still feels these LOE's are adequate for completion of the baseline risk assessment. No new information has come to light that suggests to the LWG that additional LOE's should be added to the ERA that would change a management decision. The assessment endpoints in the WP were discussed at great length with EPA (both regional and national headquarters) and EPA's partners and the LWG believes that the data collected thus far, with the inclusion of limited Round 3 data, will result in a very solid baseline ERA.

APPROACH

Benthic Organisms

- The primary LOE will be the Round 2 bioassay data collected in 2004 and resulting site-specific sediment quality values developed using the predictive model.
- The supporting LOE will be:
  - tissue data compared to toxicity reference values (TRVs);
  - surface water data compared to Ambient Water Quality Criteria (AWQC; or other screening levels); and
  - transition zone water (TZW) data compared to AWQC (or other screening levels) to assess potential risk associated with TZW.

Decision criteria:

- Potential areas of concern if any bioassay endpoint is greater than sediment quality standards or site-specific sediment quality value. Results of the bioassay (bioassay

response) will override chemistry exceedance data, where there is disagreement with the two measures.
- The supporting LOEs will be discussed if hazard quotient (HQ) > 1.
- If the TZW concentrations exceed AWQC (or other screening levels), these areas will be referred to RD/RA for further evaluation. .

Round 3 Data Needs:
- For the baseline ERA, the Round 2 bioassay and co-located sediment chemistry data, the Round 2 benthic tissue data including both field collected and the bioaccumulation invertebrate tissue data, the multiplate tissue data, surface water and TZW data, and Round 1 invertebrate tissue data will be used in the risk evaluation.
- For the FS, collection of additional surface sediment to be analyzed for total petroleum hydrocarbons (TPHs) at selected locations may be proposed (based on results of interpretive process) for Round 3 to refine Area of Potential Concern (AOPCs; including aerial extent of) associated with TPHs. This data collection event would be incorporated as part of Round 3 sediment collected for the FS (see Tab 3).
- For the FS, collection of sediments for additional bioassays may be needed (based on results of benthic interpretation report) to refine AOPCs. At that time, it will be determine if additional bioassays are needed to support the FS or would be more appropriate for RD/RA..

For the last two bullets referencing FS, it may be deemed more appropriate to collect these data in support of the RD/RA.

Shellfish:

- The primary LOE will be comparison of tissue data to TRVs.
- The supporting LOE will be Round 2 bioassay data.

Decision criterion:
- Potential area of concern if HQ >1 for all chemicals, including TBT. Because the primary LOE is very uncertain for non-bioaccumulating chemicals co-located bioassay data will supersede the HQ approach for these chemicals.

Round 3 Data Needs:
- For the ERA, the Round 2 benthic tissue data including both field collected and bioaccumulation clam tissue data and Round 1 invertebrate tissue data will be used in the baseline risk assessment.
- The LWG proposes no additional data are needed to complete the baseline ERA for shellfish populations.

Fish (for all feeding guilds)

- Risk will be assessed to all fish receptors listed in the approved WP (sculpin, peamouth, juvenile chinook salmon, largescale sucker, sturgeon, carp, lamprey ammocoetes, smallmouth bass, and northern pikeminnow). The risk will be evaluated on a population level with the exception of special-status species (i.e., juvenile chinook salmon and lamprey).
- The primary LOE for non-metabolized, non-regulated chemicals will be tissue data compared to TRV.

- The primary LOE for metabolized or regulated chemicals will be the dietary TRV approach.
- The secondary LOE will be surface water data compared to AWQC (or other screening level).
- Any existing observational information (e.g., existing skin condition or abnormalities) is not expected to be a primarily or secondary line of evidence, but the relationship to TRVs for survival, growth, and reproduction will be discussed in the baseline risk assessment.

Decision criterion:

- Potential chemical of concern if HQ > 1 (for both primary LOE's)

Round 3 Data Needs:

- For the ERA, the Round 1 fish and invertebrate tissue, Round 2 juvenile chinook whole-body and stomach content tissue, Round 2 benthic tissue data (including both field collected and the bioaccumulation invertebrate tissue data), and Round 2 multiplate tissue data will be used in the risk evaluation of fish. Round 2 surface water and Rounds 1 and 2 surface sediment will also be used.
- For the ERA, collection of pre-breeding (to be defined with EPA) sturgeon tissue will be proposed for Round 3. The scope of data collection needs to be discussed with EPA; the level of effort is expected to be 5-6 fish.
- The LWG will work with the agency team during Round 3 scoping to identify a method to collect lamprey. However, if a practical method of collecting lamprey tissue cannot be identified, the risk assessment to lamprey ammocoetes will be conducted using the tissue collected during Round 2 Benthic Sledge collection and using additional tissue data from other juvenile fish as a surrogate.
- For the FS, collection of additional sculpin tissue may be proposed following a decision process evaluating localized risks based on Round 1 sculpin tissue data and feasibility of additional tissue collection.

Wildlife

- Risk will be assessed for the bird and mammal receptors listed in the approved WP (spotted sandpiper, hooded merganser, bald eagle, osprey, mink, and river otter). The risk will be evaluated on a population level with the exception of special-status species (i.e., bald eagle).
- The primary LOE will be the dietary TRV approach.
- The supporting LOE will be the bird egg TRV modeling approach for bald eagle and osprey for a limited list of chemicals (i.e., dioxins, PCBs, DDE, and mercury).

Decision criterion:

- Potential chemical of concern if HQ > 1 (for both LOE's)

Round 3 Data Needs:

- For the ERA, the Round 1 fish and invertebrate tissue, Round 2 benthic tissue data including both field collected and the bioaccumulation invertebrate tissue data, the multiplate tissue data will be used in the risk evaluation. Rounds 1 and 2 surface sediment will also be used.
- The LWG proposes no additional data are needed to assess risk to birds and mammals and to complete the baseline ERA.

Amphibians:

- The primary LOE will be surface water data compared to AWQC (or other screening level).

Decision criterion:

- Potential area and chemical of concern if HQ >1.

Round 3 Data Needs:

- For the ERA, the Round 2 surface water data will be used in the baseline risk assessment.
- The LWG proposes no additional data are needed to assess risk to amphibians and to complete the baseline ERA.

Aquatic Plants:

- The primary LOE will be a qualitative discussion of how surface water and/or surface sediment concentrations compare to applicable toxicity screening levels.

Decision criterion:

- Because of the uncertainty associated with the risk assessment no decision criterion has been developed for the primary LOE. Instead, the qualitative discussion will be included in the ERA.

Round 3 Data Needs:

- For the ERA, the Round 1 and 2 sediment chemistry data and Round 2 surface water data will be used in the risk evaluation.
- The LWG proposes no additional data are needed to assess risk to aquatic plants and to complete the baseline ERA.
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TAB 6 - HYDRODYNAMIC MODEL, CONTAMINANT FATE AND TRANSPORT MODEL, AND RECONTAMINATION

OBJECTIVES

- **Hydrodynamic Processes**
  - Understand where contaminants could be exposed or deposited by defining areas of potential future physical sediment erosion and accretion over a range of potential river conditions.
  - Understand the needed level design (robustness and associated costs) for remedial options to withstand river forces under a variety of conditions with sufficient certainty for the FS.

- **Fate and Transport**
  - Define the long term risk outcomes (i.e., via estimation of chemical concentrations in bed sediment and fish tissue) of potential remedial options evaluated in the FS[2].
  - Define to what extent the risks in tissue originate from the sediment bed (i.e., resuspension of bed sediments) to tailor sediment cleanup to areas posing greatest risk directly and indirectly via resuspension to the water column.

- **Recontamination Potential/Natural Recovery** - Understand the impact of sources of contamination (e.g., upstream loading, upland stormwater runoff, sediment resuspension, and groundwater) in the river (on an AOPC and study area-wide basis) both currently and in the future under various potential remediation scenarios[3].

APPROACH

Hydrodynamic Processes –The LWG developed and completed Phase 1 of an Environmental Fluid Dynamics Code (EFDC) – based hydrodynamic/sedimentation model in 2005 and identified site-specific model data needs for collection in 2006. The site-specific data needs include:

- Determination of erosion rates, critical erosion shear stress measurements, and bed physical properties with depth in the sediment column from sediment cores collected at multiple locations in the study area using the Sedflume system
- Determination of fine-grained sediment settling velocity at four locations in the study area and one upstream location

[2] This objective was defined by EPA in two parts in their Data Gaps Document and in the December 13, 2005 meeting with LWG. The first part was related to understanding long term sediment chemical concentrations after remediation. The second part was related to the future risks from fish tissue and how long those might persist. We believe that these two objectives can be collapsed into the one overall objective related to risk outcomes for remedial options as stated here.

[3] Data gaps for surface water and transition zone water that relate primarily to this objective are discussed under AOPCs in EPA's data gaps document. However, this is primarily an issue of fate and transport of chemicals into and throughout the river and should be addressed in this category.

- Measurement of TSS in the study area and mouth of the Multnomah Channel under relatively low- and high-flow conditions
- Time-series measurement of TSS at an upstream location below the confluence of the Willamette and Clackamas rivers over a range of flow conditions to further assess the relationship between river inflows and suspended sediment loads
- If the proper hydrologic conditions occur (flows on the Willamette exceed 100,000 cfs), perform a short-term, time-series bathymetric survey and TSS sampling along three cross-river transects in the study area.

These data will be incorporated into Phase 2 of the modeling effort in 2006 and are being collected to improve calibration/performance of the sediment transport portion of the model and thus the ability of the model to achieve specific project objectives. These data can also be used empirically to addressing site-specific sediment stability questions.

Fate and Transport

Because the Fate and Transport objectives are focused estimating chemical concentrations in the sediment bed and within fish tissue, we proposed in the Work Plan and continue to propose models that target the complex exchange processes within these "compartments". This approach does not attempt to trace all mass within arbitrary segments of the river system (per EPA's proposed approach), which is difficult, but rather directly measures or estimates each of the inputs and outputs to just these specific parts of the system most relevant to the objectives.

- For sediment bed chemical concentrations, use models that assess ongoing dynamic changes through a variety of processes including (but not limited to): sedimentation, burial, mixing of the sediment bed, diffusion, advection (groundwater and otherwise), and degradation.
  - Several sediment bed models developed by Boudreau have been previously proposed for consideration (others also exist).
  - The inputs and outputs to these models are defined by site-specific empirical measurements at various locations (e.g., surface water, sediment trap, transition zone water sampling) for each input and output..
  - These models can be used to predict sediment bed chemical concentrations any desired number of years in the future and with a variety of potential starting conditions (e.g., post remediation or current conditions) that can be compared to risk-based sediment goals to understand potential future risks.

- For fish tissue chemical concentrations, use the Food Web Model and other tools (BCFs, BSAFs, etc. for some chemicals as noted in Tab 7) already developed by the LWG. To understand potential future risks to fish tissue, input expected sediment bed chemical concentrations from the above sediment bed model and surface water concentrations from estimates of future upland site source control input reductions (from DEQ).
- For defining contribution of sediment resuspension to fish tissue risks via the water column, collect information on resuspension from hydrodynamic modeling efforts,

sediment traps, sediment radioisotope cores, vertically stratified water column sampling both near and away from potential surface water/stormwater sources, and DEQ supplied upland source input concentrations (e.g., outfalls) to understand the relative contribution of potential resuspension sources to the water column on a concentration (rather than mass) basis. Use this information to estimate expected reductions in surface water column concentrations due to elimination of sediment resuspension sources by sediment remediation options and input these reduced surface water column concentrations in to the Food Web Model to predict future fish tissue risks under various sediment remediation alternatives.

LWG does not believe that the EPA proposed fate and transport modeling approach will achieve the objectives of the fate and transport evaluation as summarized above. Because the EPA proposed approach does not attempt to reproduce many of the most important physical and chemical processes that are known to cause the chemical concentrations observed in bed sediments or surface waters. However, regardless of the model used, we would propose a more rigorous process for defining the data gaps to support such models. At a minimum, we would propose first developing a Portland Harbor-specific version of any model using all existing data and then testing that version for sensitivity and uncertainty to identify those model parameters that would provide the greatest information and provide the most cost-effective sampling. The specific sample collection data gaps that most effectively improve the model accuracy would then be developed.

Recontamination/Natural Recovery – The same models focusing on the sediment bed and fish tissue can be used to meet these objectives as well. Where specific sources (on an APOC or other basis) need to be understood, site-specific data can be collected (most likely by DEQ) and the proposed sediment bed models can be run on an AOPC or regional basis. The resulting sediment model outputs can be used in the site-wide Food Web Model to identify how concentrations in various fish species' tissues are affected. Where ongoing levels of upland source inputs are assumed to continue or expected reductions in those inputs are estimated or assumed, various predictive scenarios of natural recovery and/or recontamination can be estimated for both the sediment bed and fish tissue using these models.

TAB 7 - FOOD WEB MODEL

OBJECTIVES

As stated in the most recent iteration of the Food Web Model (FWM) Report, (submitted November 2005): "The primary goal of food web modeling for the RI/FS is to develop a predictive relationship between chemical concentrations in sediment, water, and tissue that can be used to derive preliminary sediment cleanup goals for chemicals that are present in fish tissue at concentrations associated with unacceptable risk."

The FWM will provide predictions of tissue concentrations of hydrophobic organic chemicals from sediment and water chemical concentrations. For many other chemicals, approaches such as BSAFs, BCFs, and BAFs may be more appropriate for describing these relationships. The objective of FMW development is to produce a tool that may be used in the risk assessment for developing preliminary remediation goals (human health and ecological) and in the feasibility study for comparing remedial alternatives and residual risk assessment (as described in Tab 6).

The Food Web Model can also be used to help support specific aspects of Fate and Transport related objectives as discussed in Tab 6.

Food web models have been developed that are predictive within a factor of five of average measured tissue data of modeled species at other large river Superfund sites (e.g. Hudson, Fox, and Sheboygan Rivers). The potential to significantly reduce uncertainty and the intended FWM applications are major considerations in determining how collected data will be used and the potential benefits of additional data. Below, major categories of data for the FWM and their current and anticipated sources are summarized. The spatial scales at which the model is to be applied have not yet been agreed upon, but are also very relevant considerations for both data needs and model applications. The LWG looks forward to additional dialogue with EPA and its partners on these issues.

APPROACH

Water Data

- Water quality parameters (chemical concentrations, temperature, etc.) are inputs to FWM

Data Sources:
Oregon Department of Environmental Quality monitoring and Round 2 Events 1-3 surface water data and additional surface water data collected in Round 3

Sediment

- Sediment chemistry data (chemical concentration and sediment organic carbon) are inputs to FWM

Data Sources:
Completed Round 1 and 2 surface sediment data, as well as additional sediment collected as part of the Round 2 Bioaccumulation study. Non LWG collected sediment data will also be considered for inclusion based on data quality and relevance.

Zooplankton and Phytoplankton

- Average lipid content, weight, and moisture content for zooplankton and phytoplankton (separately) are input parameters
- Average chemical concentrations in phytoplankton and zooplankton (separately) are used to calibrate model

Data Sources:
Literature data will be used for input parameters. BAF and BCFs will be used to estimate tissue concentrations used for model calibration. Model predictions for zooplankton will also be compared qualitatively to results of chemical analyses of Multiplates. Because phytoplankton are consumed by zooplankton, it is important to have separate biological data or estimates for each for the FWM. The reconnaissance study with the Bongo net indicated that zooplantkon and phytoplankton cannot be separated in a cost efficient manner.

Benthic organisms (including shellfish):

- Average lipid content, weight, and moisture content for benthic species are input parameters
- Average chemical concentrations in benthic organisms are used to calibrate model

Data Sources:
Round 1 invertebrate tissue sampling and additional field collected clams from Round 2 bioaccumulation study.

Fish (for all fish included in FWM)

- Average lipid content, weight, and moisture content for fish species are input parameters
- Average chemical concentrations in fish are used to calibrate model

Data Sources:
Round 1 fish tissue and possible Round 3 sculpin tissue, if additional data are justified for risk assessment applications (see Tab 5). The model is used to predict average tissue concentration, therefore averaged data, such as from composites, is sufficient for both model input and as calibration for model output.